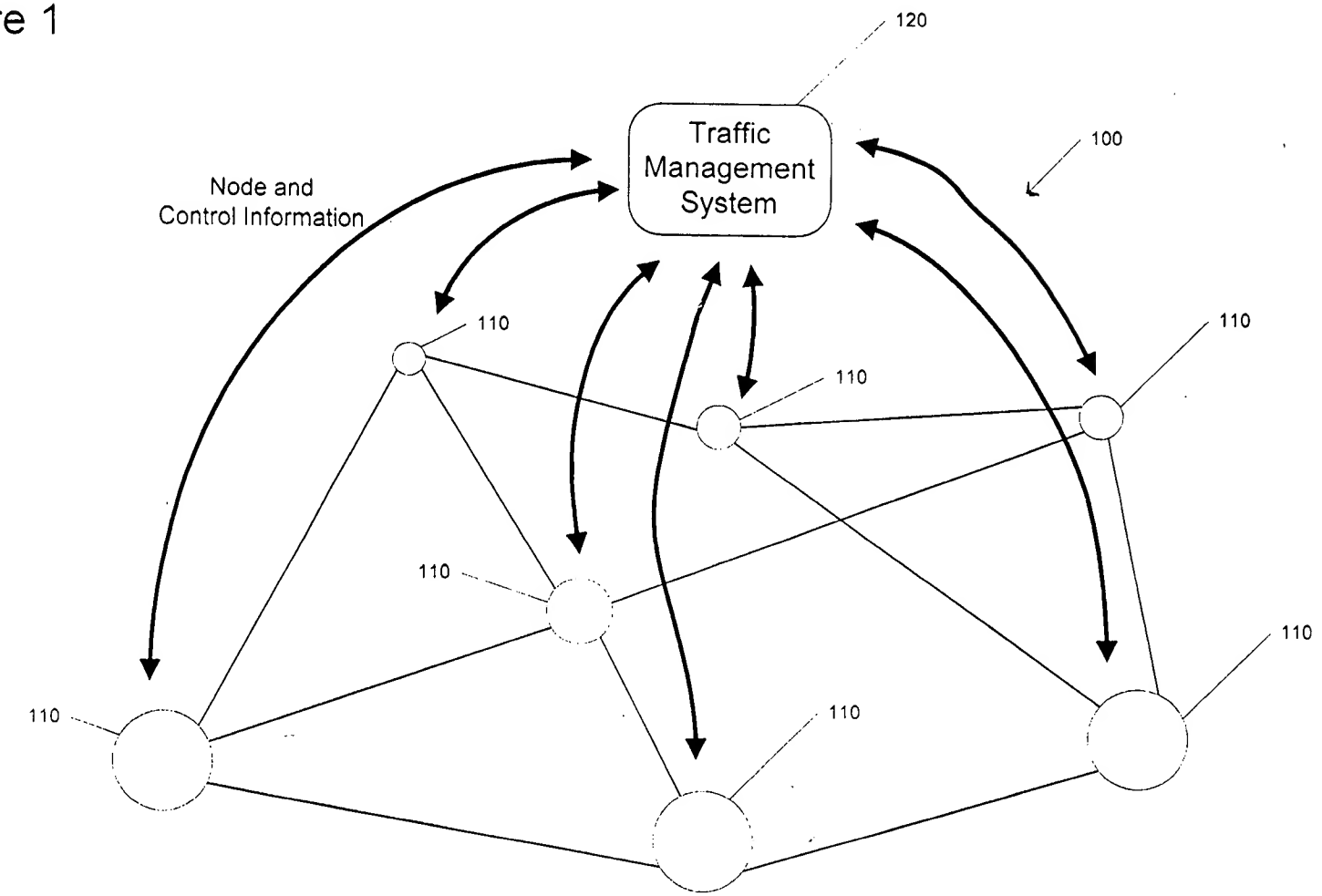
PCT/US2003/027260

Figure 1



JP2010-527760

Figure 2

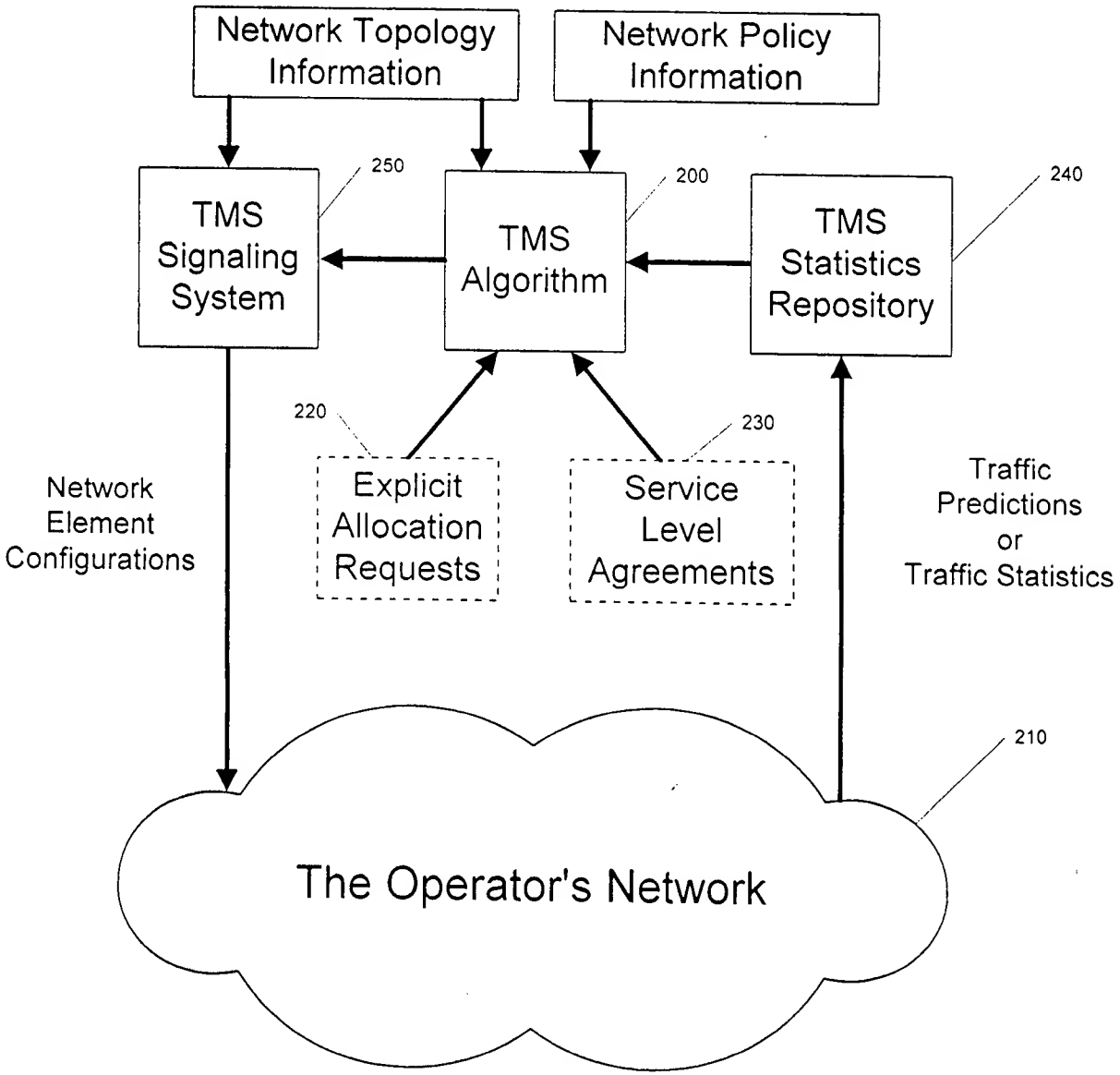


Figure 3

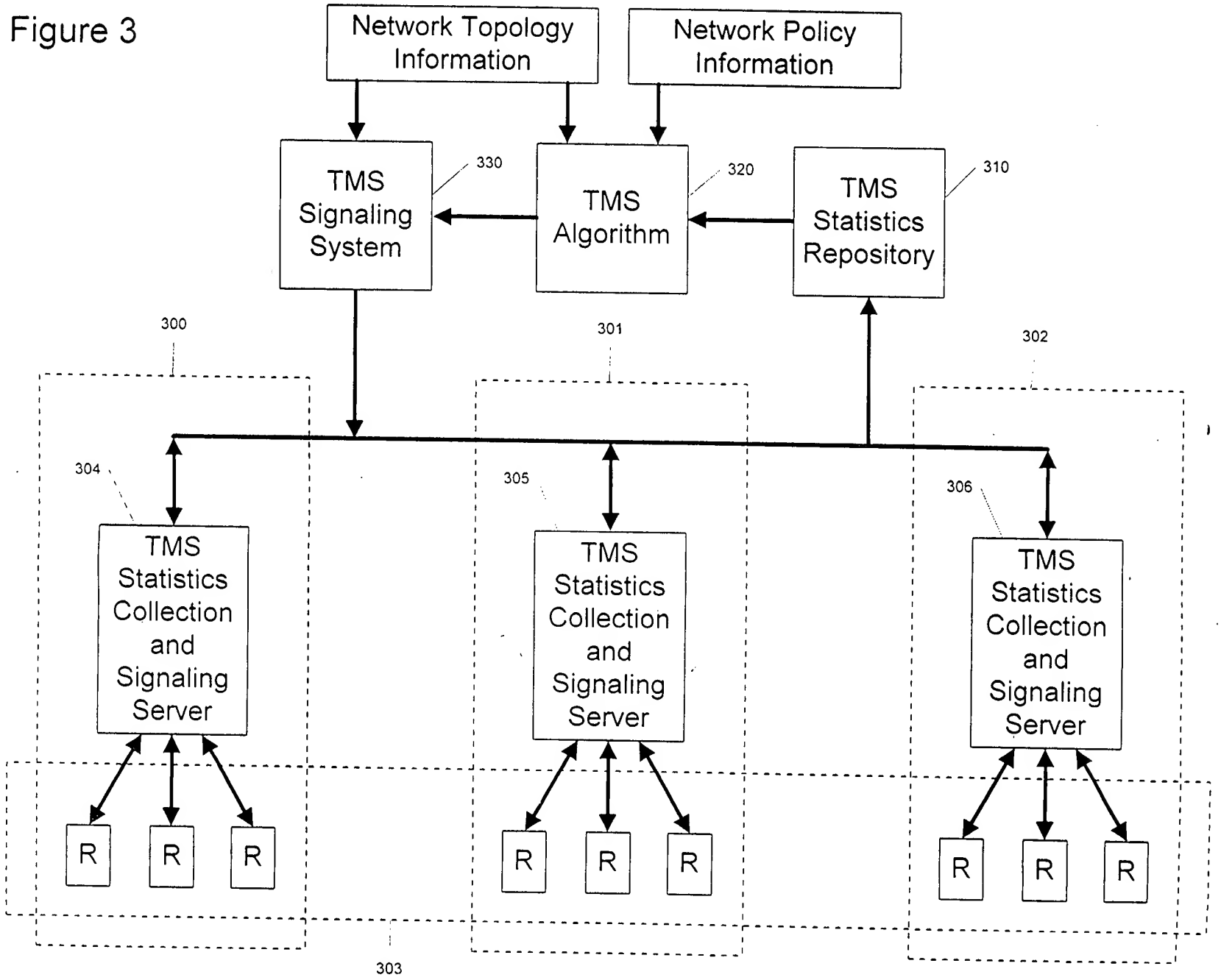

Network Topology Information
Network Policy Information
TMS Signaling System
330
TMS Algorithm
320
TMS Statistics Repository
310
300
301
302
304
305
306
TMS Statistics Collection and Signaling Server
TMS Statistics Collection and Signaling Server
TMS Statistics Collection and Signaling Server
R
R
R
R
R
R
R
R
R
303

Figure 4

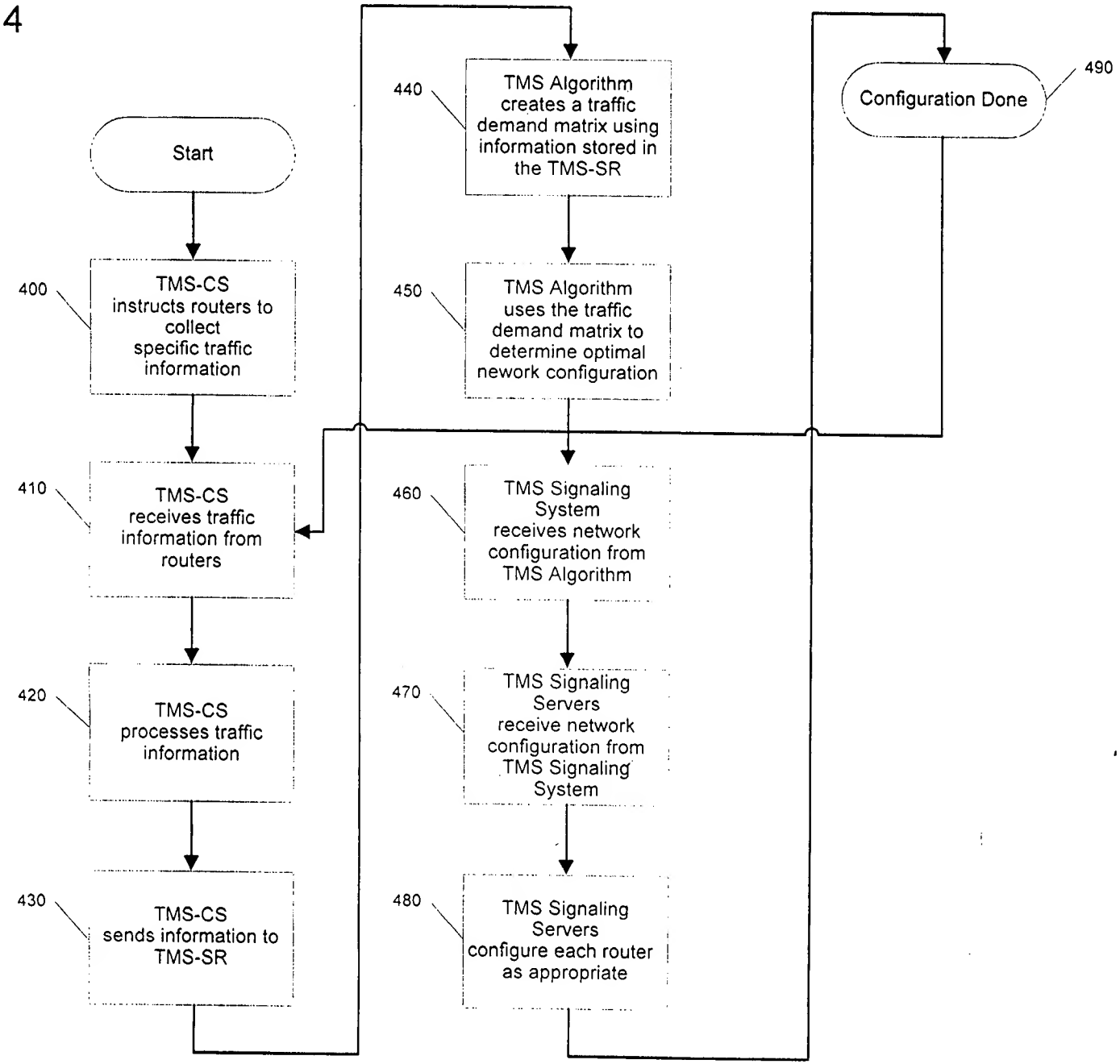

Start
400
TMS-CS instructs routers to collect specific traffic information
410
TMS-CS receives traffic information from routers
420
TMS-CS processes traffic information
430
TMS-CS sends information to TMS-SR
440
TMS Algorithm creates a traffic demand matrix using information stored in the TMS-SR
450
TMS Algorithm uses the traffic demand matrix to determine optimal nework configuration
460
TMS Signaling System receives network configuration from TMS Algorithm
470
TMS Signaling Servers receive network configuration from TMS Signaling System
480
TMS Signaling Servers configure each router as appropriate
490
Configuration Done

Figure 5

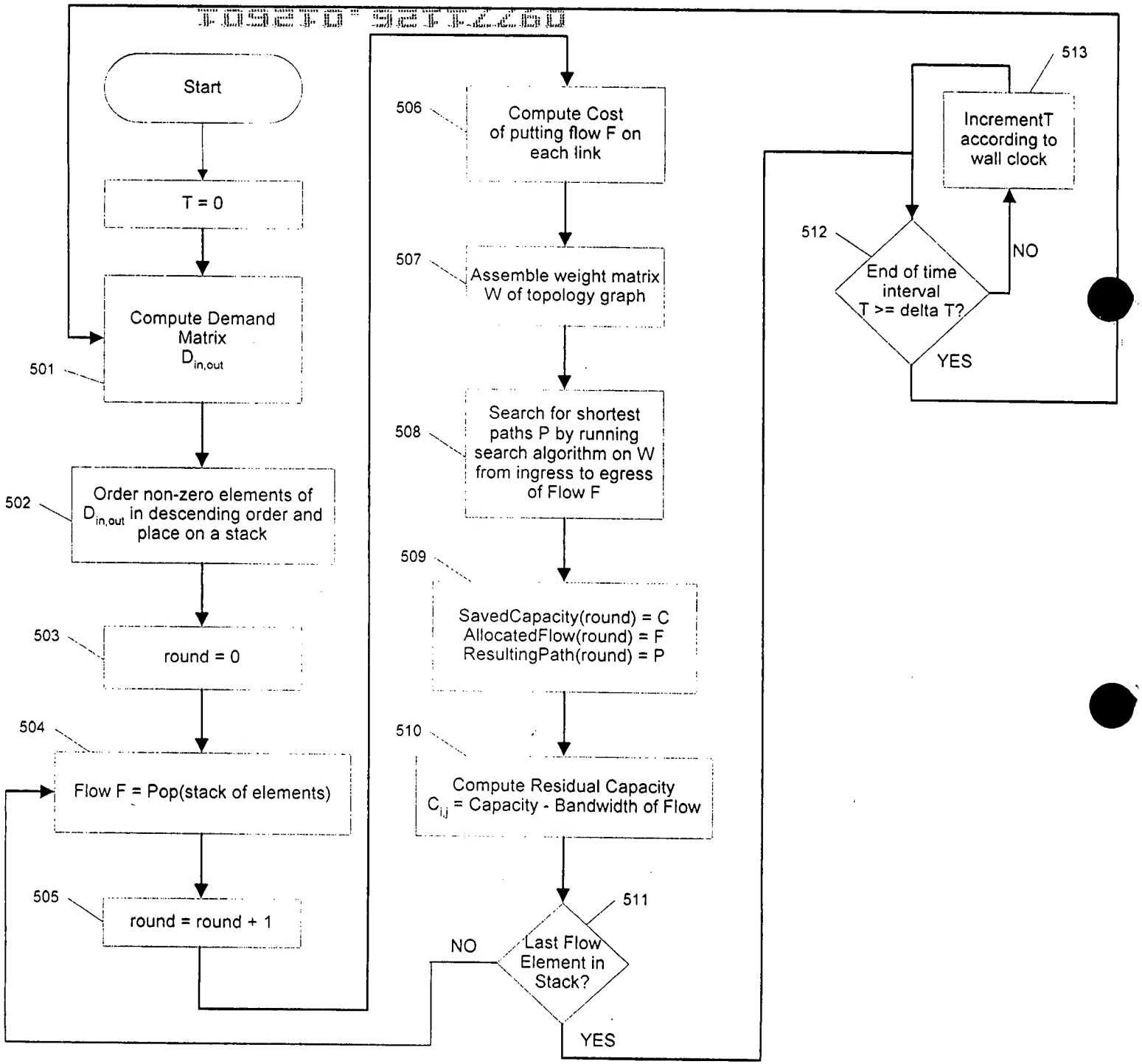

Start
T = 0
Compute Demand Matrix $D_{in,out}$
501
Order non-zero elements of $D_{in,out}$ in descending order and place on a stack
502
round = 0
503
Flow F = Pop(stack of elements)
504
round = round + 1
505
Compute Cost of putting flow F on each link
506
Assemble weight matrix W of topology graph
507
Search for shortest paths P by running search algorithm on W from ingress to egress of Flow F
508
SavedCapacity(round) = C
AllocatedFlow(round) = F
ResultingPath(round) = P
509
Compute Residual Capacity $C_{i,j}$ = Capacity - Bandwidth of Flow
510
Last Flow Element in Stack?
511
NO
YES
End of time interval T >= delta T?
512
NO
YES
IncrementT according to wall clock
513

Figure 6

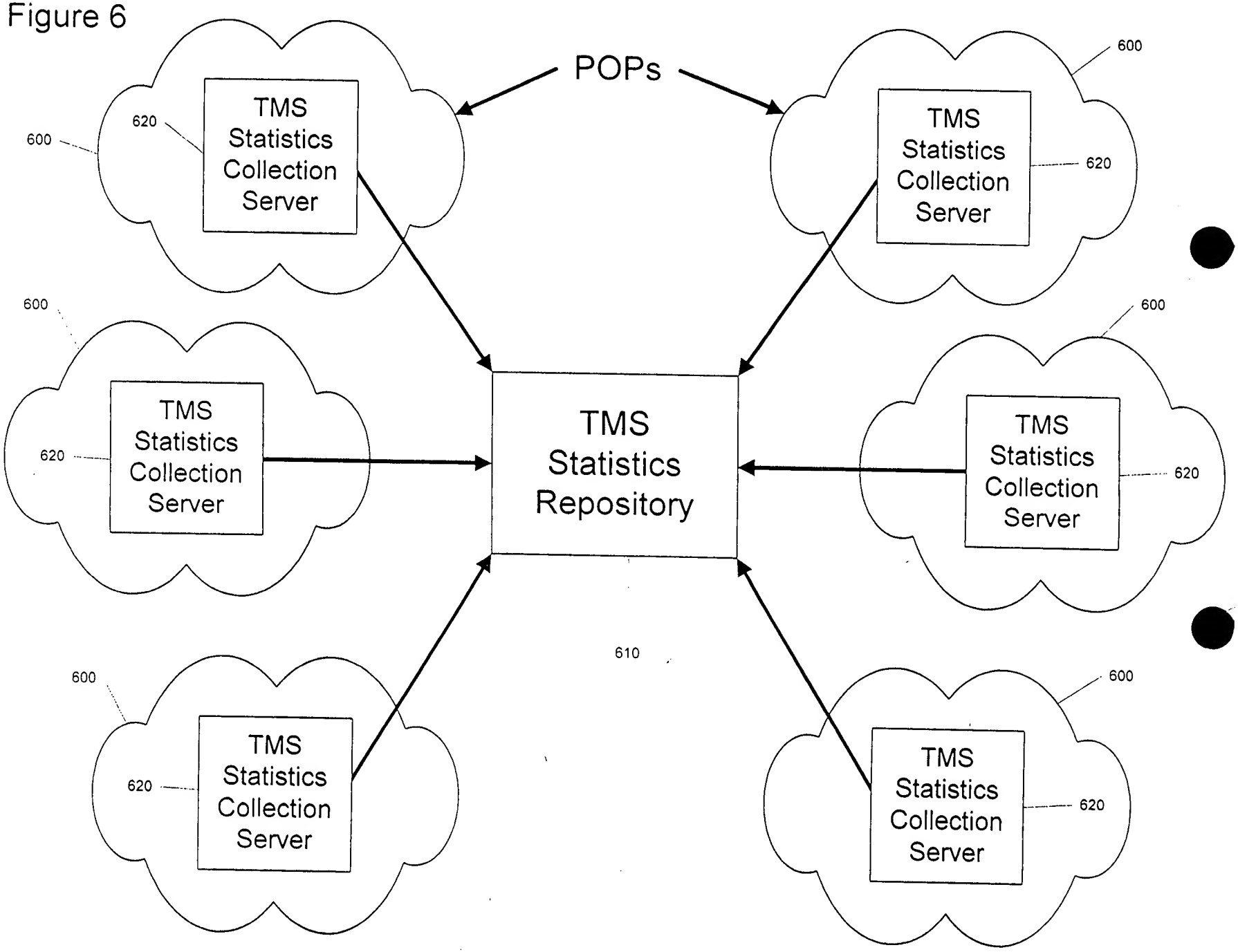
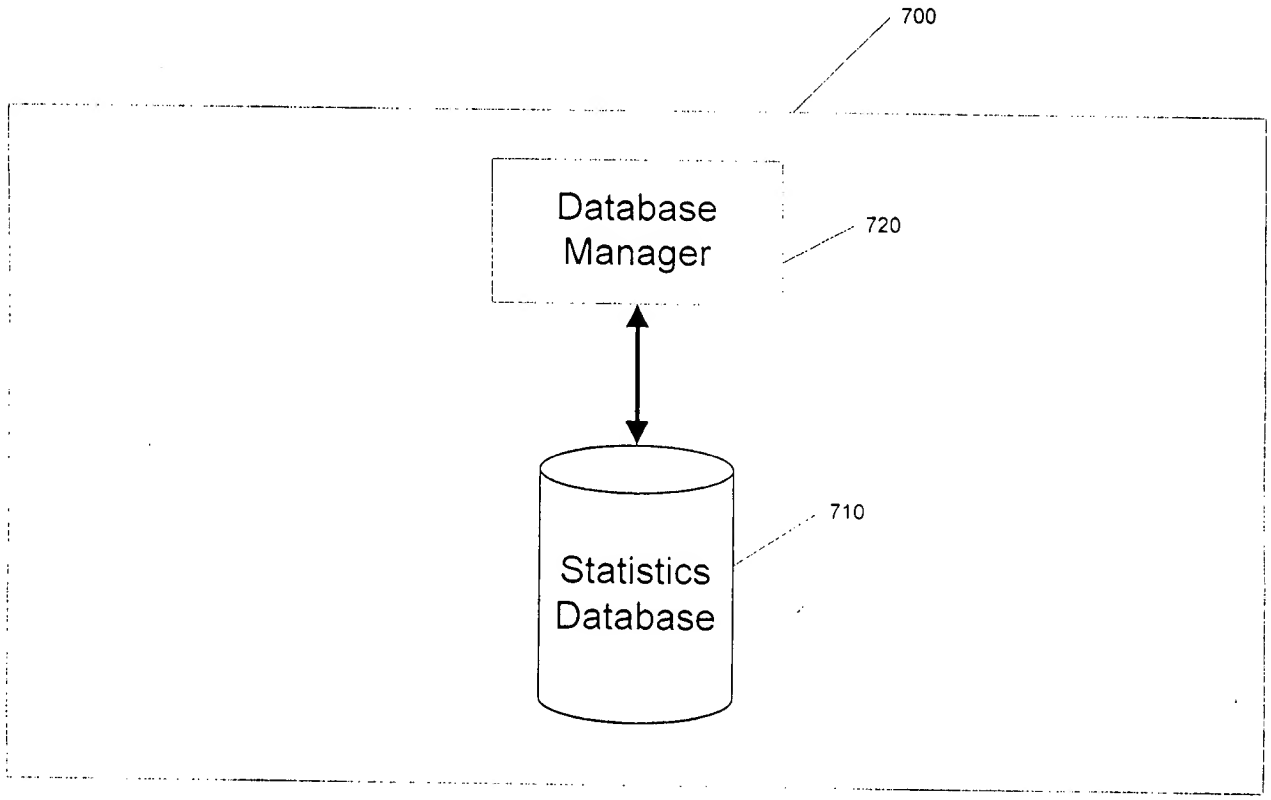

POPs
TMS Statistics Collection Server
620
600
TMS Statistics Repository
610

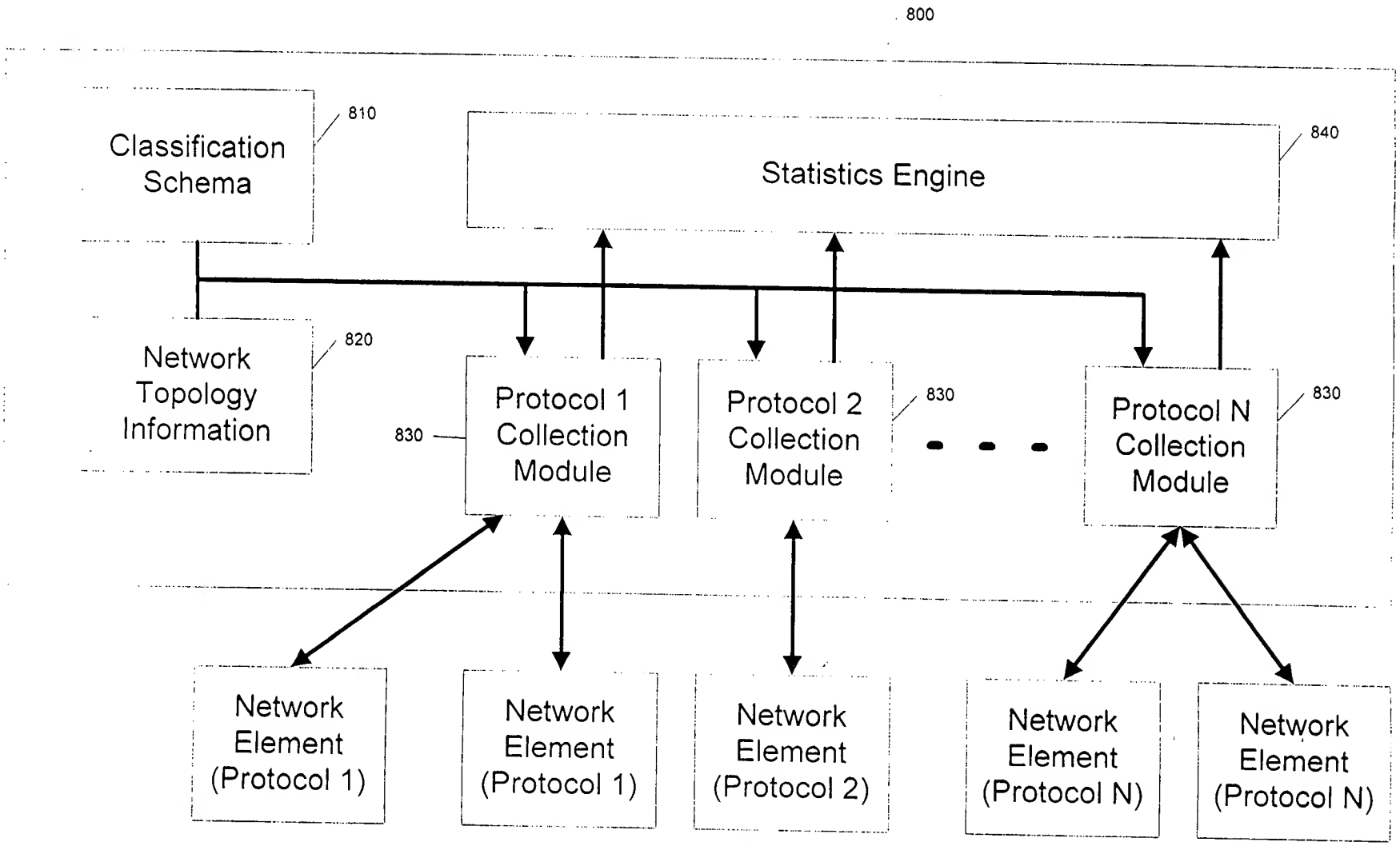
Figure 7



TMS Statistics Repository

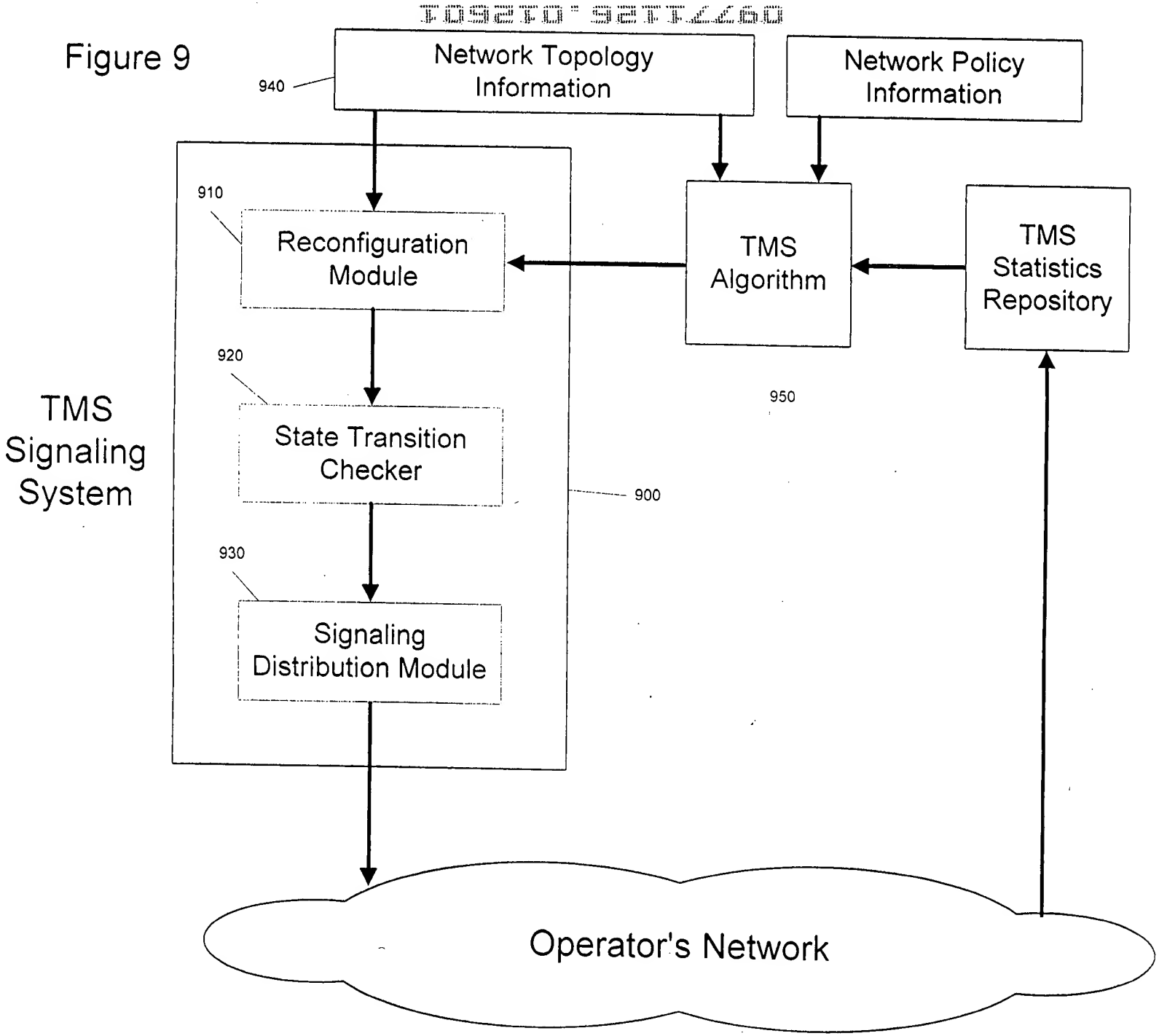
TD9210 92TL260

Figure 8



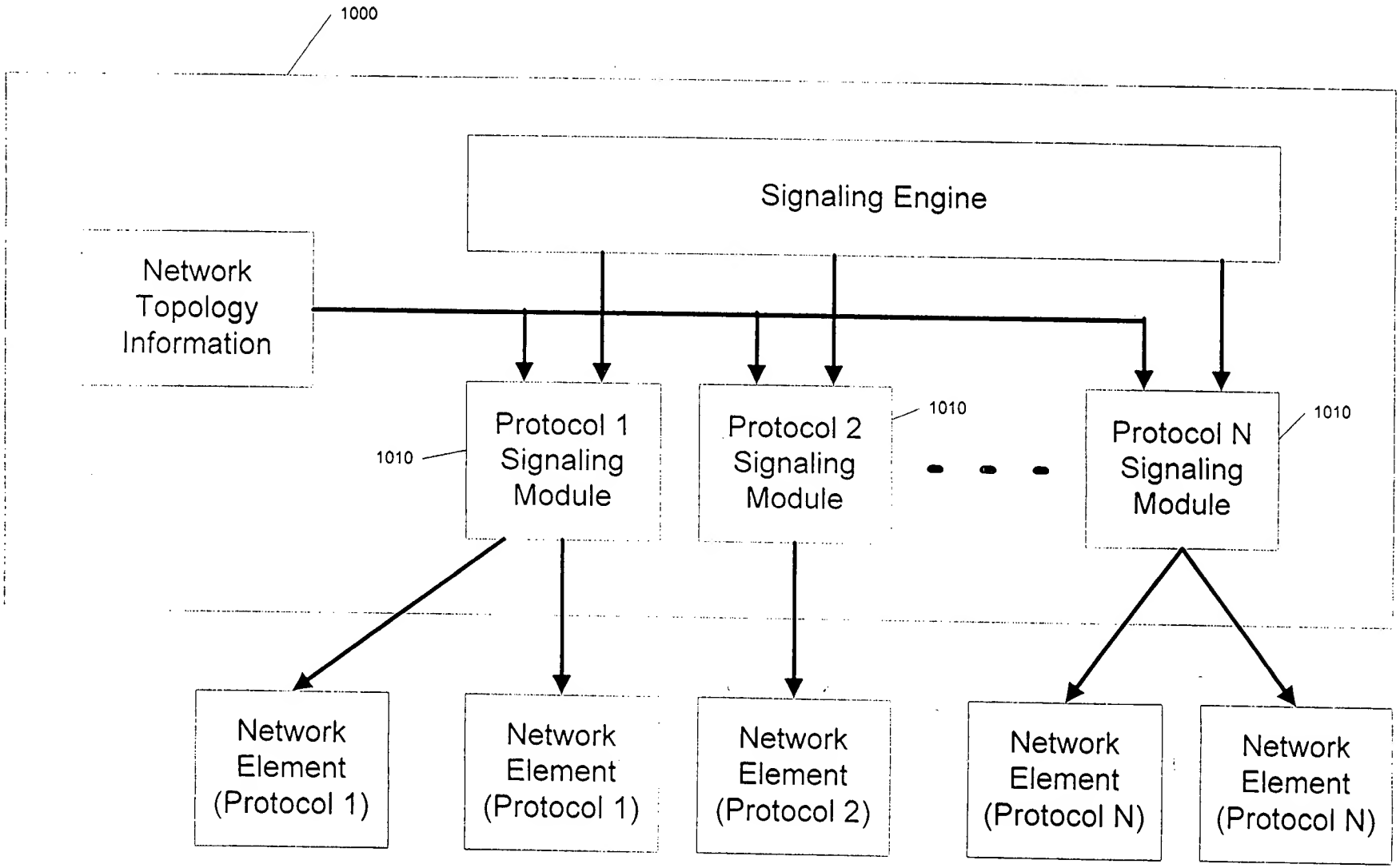
TMS Statistics Collection Server

Figure 9


Network Topology Information
940
Network Policy Information
910
Reconfiguration Module
TMS Algorithm
TMS Statistics Repository
920
State Transition Checker
950
TMS Signaling System
900
930
Signaling Distribution Module
Operator's Network

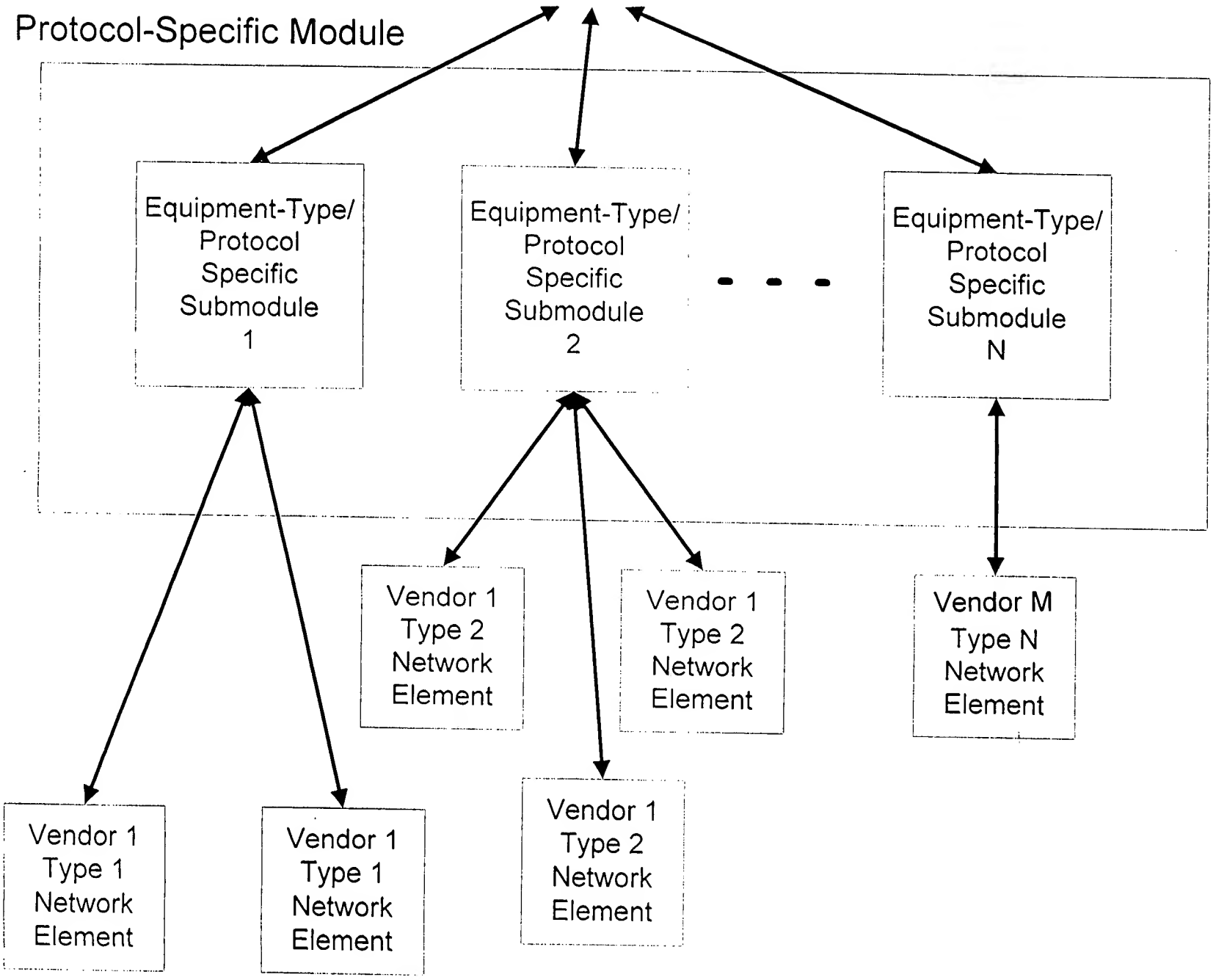
TO92TO" 92TT2760

Figure 10



TMS Signaling Server

Figure 11


Protocol-Specific Module
Equipment-Type/ Protocol Specific Submodule 1
Equipment-Type/ Protocol Specific Submodule 2
Equipment-Type/ Protocol Specific Submodule N
Vendor 1 Type 1 Network Element
Vendor 1 Type 1 Network Element
Vendor 1 Type 2 Network Element
Vendor 1 Type 2 Network Element
Vendor 1 Type 2 Network Element
Vendor M Type N Network Element